

Beneficial Use Reconnaissance Program Field Manual for Streams

Department of Environmental Quality



**Beneficial Use Reconnaissance Program
Technical Advisory Committee**

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Abstract

The purpose of the Beneficial Use Reconnaissance Program (BURP) is to help Idaho meet the requirements of the federal Clean Water Act by assisting with determinations of the existing uses and beneficial use support status of Idaho's water bodies. BURP started in 1993 as a pilot project and evolved into an ongoing program.

The BURP program conducts monitoring activities at selected sites, emphasizing sampling and analysis to support assessments of biological assemblages and physical habitat structure of streams. These assessments support characterization of individual stream integrity and the total quality of Idaho's waters. The Department of Environmental Quality's (DEQ's) past monitoring and assessment practices and the U.S. Environmental Protection Agency's rapid bioassessment protocols provided the foundation for BURP monitoring protocols.

This field manual provides information needed for consistency in monitoring among DEQ crews along with other entities interested in following these methods. This manual is an important part of the quality assurance/quality control of BURP stream monitoring data.

This field manual includes a process for selecting representative sampling sites and a suite of variables to sample. Each variable is defined and the rationale for using it is given, along with a description of the field methods used to measure or collect it. Selected literature is cited and literature for further reading is referenced at the end of the manual. The main variables include discharge, width/depth, shade, bank cover and stability, substrate, habitat types, pool complexity, large organic debris, stream channel classification, habitat assessment, temperature, conductivity, macroinvertebrate assemblages, periphyton assemblages, fish assemblages, bacteria (*E. coli*), and amphibians. The manual describes how to make a record for each reach that includes a standardized stream name, exact reach location (latitude and longitude), and photographs. Later in the assessment process, the data collected during BURP monitoring will be compared to data from reference sites.

Safety of BURP monitoring activities is very important and is stressed in this manual. A decontamination section also emphasizes the importance of cleaning field gear to help prevent the transfer of aquatic organisms, diseases, and plant life.

Acronyms, Abbreviations, and Symbols

mmhos	micromhos
mS/cm	microsiemens per centimeter
AU	assessment unit
BLM	Bureau of Land Management
BOR	Bureau of Reclamation
BURP	Beneficial Use Reconnaissance Program
CALM	Consolidated Assessment and Listing Methodology
cfs	cubic feet per second
CPR	cardiopulmonary resuscitation
DEQ	Idaho Department of Environmental Quality
DO	dissolved oxygen
EDMS	Environmental Data Management System
EF	electrofishing
EPA	U.S. Environmental Protection Agency
ETOH	ethyl alcohol
GNIS	Geographic Names Information System
GIS	geographic information system
GPS	global positioning system
HUC	hydrologic unit code
IDFG	Idaho Department of Fish and Game
IDL	Idaho Department of Lands
IDWR	Idaho Department of Water Resources
LOD	large organic debris
LWD	large woody debris
m	Meter
mg/L	milligrams per liter
ml	milliliter
mm	millimeter
MSDS	material safety data sheets
NRCS	National Resource Conservation Service
PEL	permissible exposure limit
ppm	parts per million
QA	quality assurance
QC	quality control
SHI	stream habitat index
SMI	stream macroinvertebrate index
STORET	Storage/Retrieval Data System
TWA	time weighted average
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WBAG	Water Body Assessment Guidance

WBID	water body identification system; individual water body identification
WD	wetted depth
W/D	width:depth ratio

Introduction

Development of the Beneficial Use Reconnaissance Program

The Beneficial Use Reconnaissance Program (BURP) has evolved from a pilot project into an ongoing program. In 1993, a pilot project aimed at integrating biological and chemical monitoring with physical habitat structure assessment to characterize the integrity of a stream and the quality of its water (McIntyre 1993a) was initiated by the Division of Environmental Quality (now the Department of Environmental Quality [DEQ]). This pilot project was also developed in order to meet the Clean Water Act requirements of monitoring and assessing biology and developing biocriteria. This pilot relied heavily on protocols for monitoring physical habitat and macroinvertebrates developed by Idaho State University and DEQ in the early 1990s. It closely followed the rapid bioassessment protocols for use in streams and rivers developed by the U.S. Environmental Protection Agency (Plafkin et al. 1989, Barbour et al. 1999). In the pilot, the project attempted to use the best science and understanding available to characterize water quality based on biological communities and their attributes.

Current BURP Organization, Process, and Results

The successful 1993 pilot was expanded statewide in 1994 (McIntyre 1994; Steed and Clark 1995) and is now an ongoing program. The BURP organization consists of a central contact person, regional coordinators, and technical support staff. The program contact person in the state office provides overall planning, budget control, and oversight. The program is implemented by the regional BURP Coordinators, who prepare for and direct each year's field work. This includes developing methods, hiring crew members, conducting centralized training, supplementing centralized training as needed with regional information, and directing field work. Also, throughout the season the BURP Coordinators ensure data (chiefly field forms) and samples are properly submitted for analysis. The regional BURP Coordinators plan and supervise their field work each year in accordance with the annual work plan (see Clark 2003 for an example). Technical Services staff members in the DEQ state office prepare the annual BURP work plan, manage the BURP database, ensure quality assurance requirements are met, and provide technical expertise as requested. The activities in the BURP work cycle, along with the way the results of BURP monitoring are used, are shown in Figure 1.

Purpose and Scope of This Manual

The purpose of this field manual is to provide information needed for statewide consistency in BURP stream monitoring and data collection activities. This manual describes how BURP collects data, laying out the assumptions, methods, and equipment required. Further information regarding annual objectives, pilot studies, and anticipated monitoring locations are provided in the annual BURP work plan.

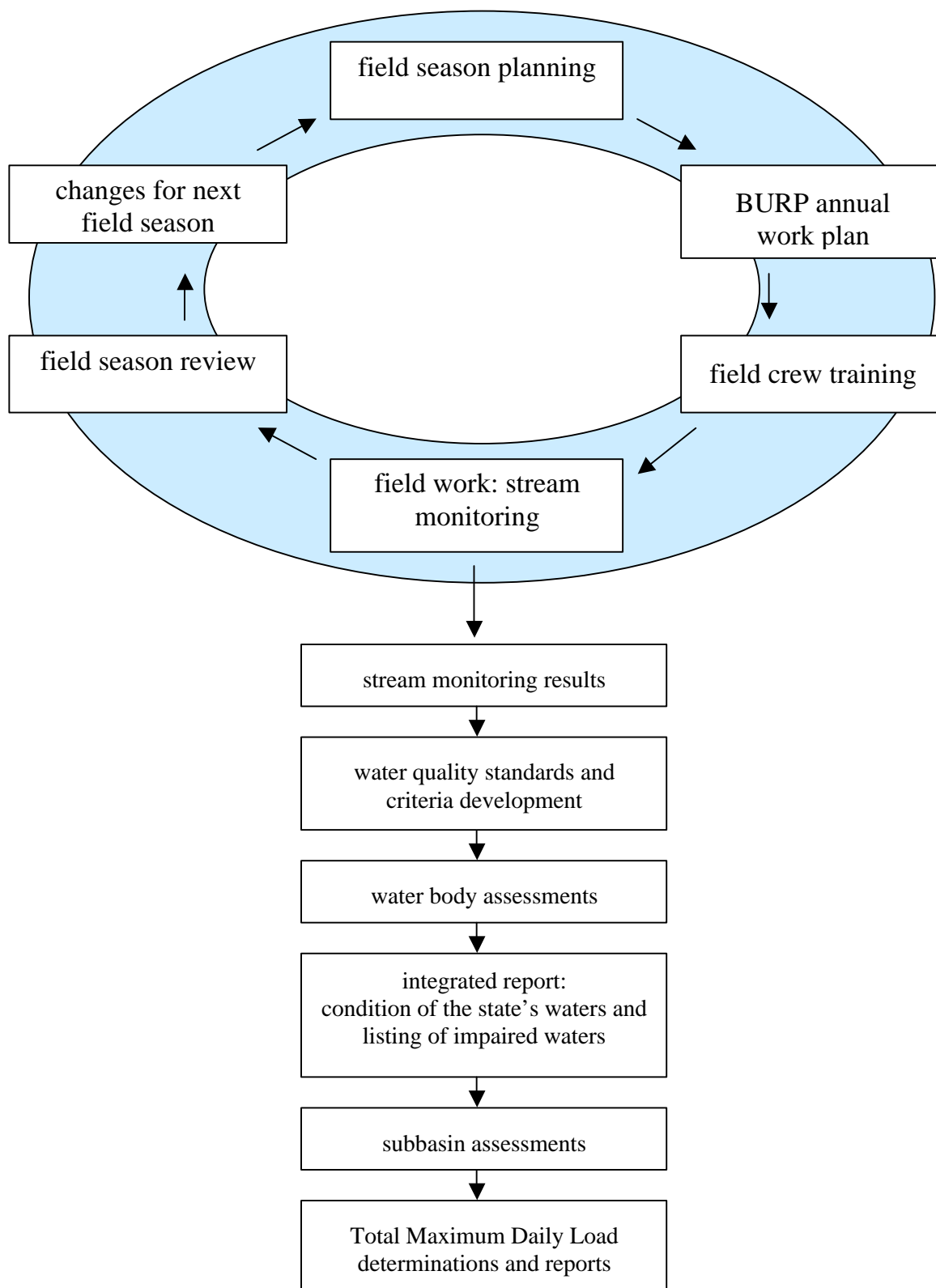


Figure 1. Annual work cycle and use of monitoring results.

This manual does not describe the analysis and interpretation of the data collected. Interpretation of BURP data and any other relevant water quality information is described in DEQ's *Water Body Assessment Guidance* (WBAG II) document (Grafe et al. 2002a), which outlines the process DEQ uses to determine the beneficial use support status of designated and existing beneficial uses.

The manual provides BURP crew members with specific protocols used in BURP monitoring surveys. Information is included for each monitoring variable, along with other information about BURP field work. In addition, a rationale for including each variable and for the method used to monitor that variable are presented, so others can follow the same protocols if they choose.

Organization of This Manual

This manual is divided into six main sections. The first four correspond with the four phases of BURP field activities depicted in Figure 2.

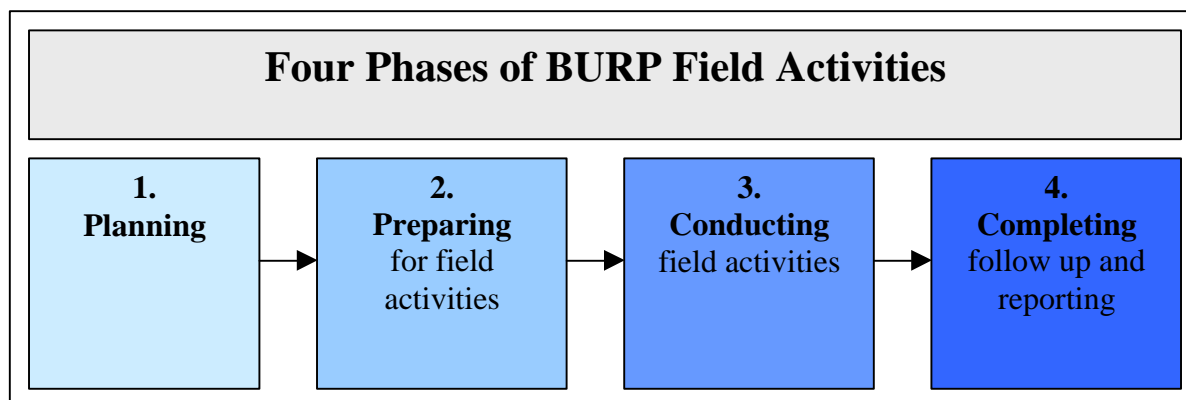


Figure 2. Four phases of BURP field activities.

Section 1 discusses planning and section 2 covers preparing for field activities. Section 3, Conducting BURP Field Activities, includes the detailed protocol methods used by BURP field crews, and is by far the most detailed. Its organization follows that of the field forms that are filled out as monitoring activities are conducted at a site, so that each variable recorded during a BURP survey is discussed in this manual in the same order and under the same name as it appears on the field forms. Within section 3, each page of the field forms has a subsection and each variable has a further subsection within that.

Section 4 contains a brief description of activities that must be completed during a BURP survey. Section 5 discusses quality assurance and quality control (QA/QC), while section 6 discusses safety. The last sections are literature references, a glossary, an index of monitoring variables, and appendices.

Overview of BURP Field Activities

These four phases (planning, preparing, conducting, and completing) make up the annual BURP cycle. The typical time of year for conducting each phase is shown in Figure 3.

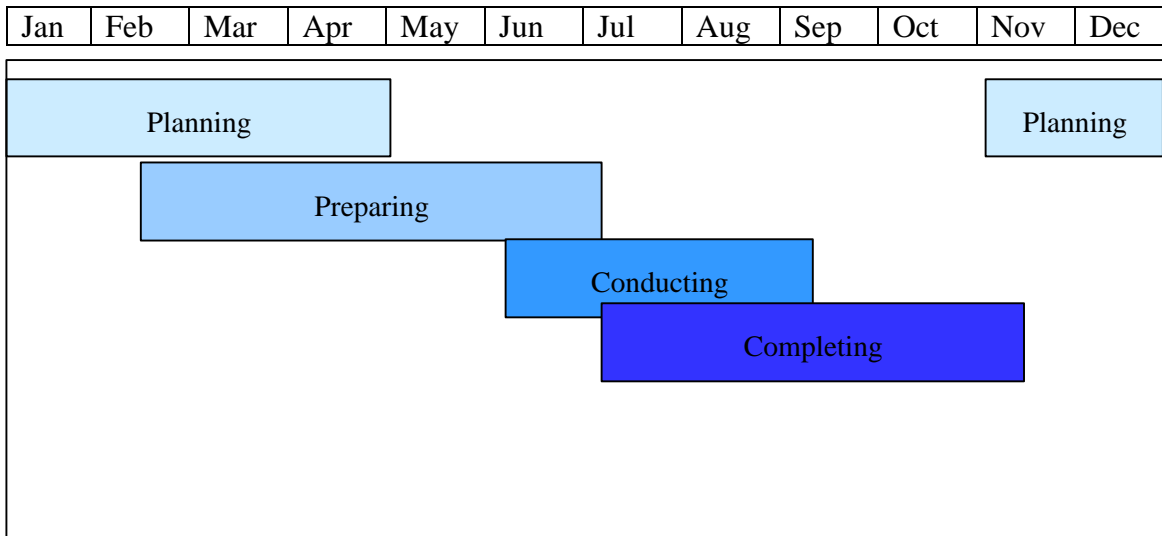


Figure 3. Typical timing of the four phases of BURP field work.

1 Planning BURP Field Activities for Streams

The planning phase is broken down into four parts: reviewing related data, coordinating aquatic monitoring, determining size classification of targeted water bodies, and pre-selecting BURP monitoring sites (final site selections will be made in the field). These four parts are shown in the Planning box in Figure 4.

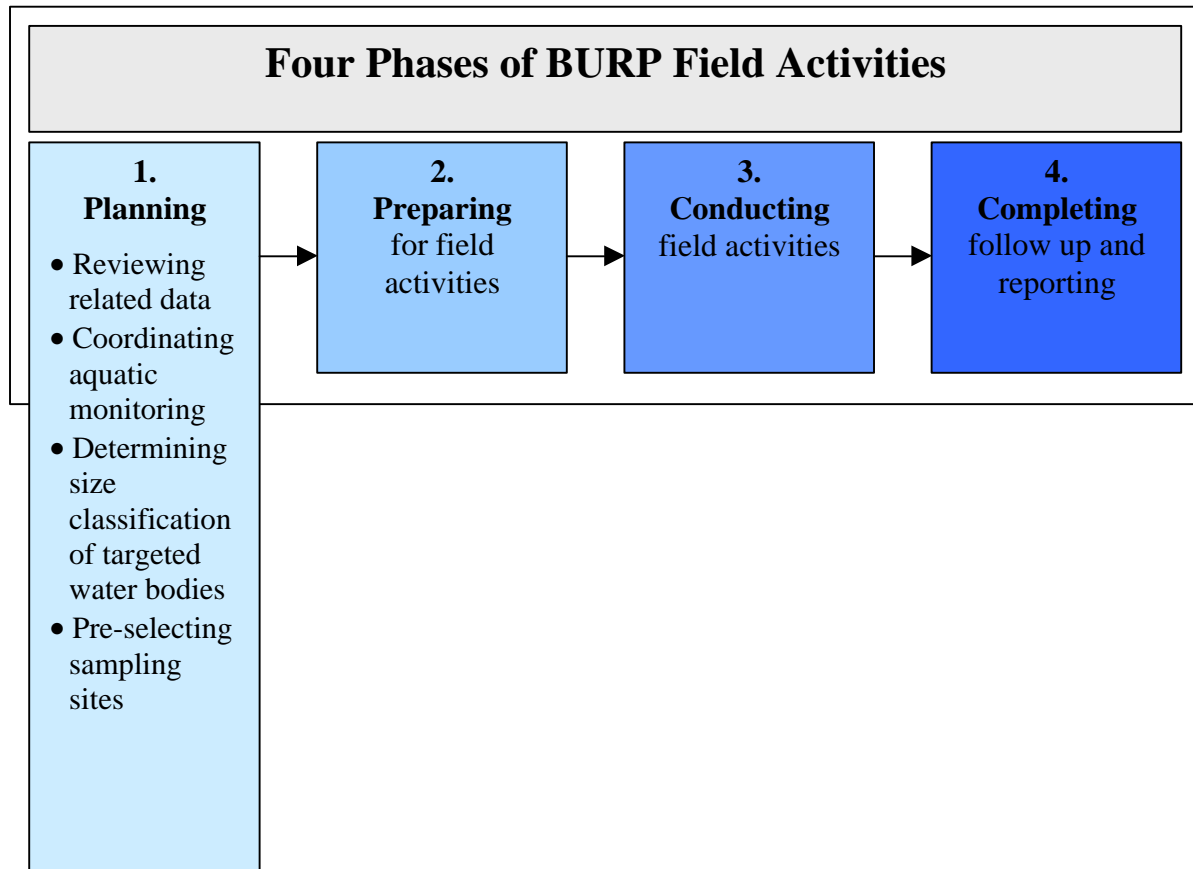


Figure 4. Parts of the planning phase.

1.1 Reviewing Related Data

It is important to review stream and geographic data and other information from outside DEQ when preparing to monitor water bodies. This is a cost-effective step that should be performed for each monitoring reach. To identify potential data sources, the regional BURP Coordinator should try to obtain data and information about the targeted water bodies from resources including:

State Agencies

- Idaho Department of Fish and Game (IDFG)
- Idaho District Health Departments

- Idaho Department of Water Resources (IDWR)
- Idaho Department of Environmental Quality (DEQ) (internal sources)

Federal Agencies

- Bureau of Land Management (BLM)
- Bureau of Reclamation (BOR)
- Natural Resource Conservation Service (NRCS)
- U. S. Bureau of Mines
- U.S. Fish and Wildlife Service (USFWS)
- U.S. Forest Service (USFS)
- U.S. Geological Survey (USGS)
- U.S. Environmental Protection Agency (EPA)

Tribal Nations

- Native American tribal nations with an interest in or information about the water bodies to be studied

Academic Institutions

- Universities
- Professional academies

Information Repositories

- Environmental Data Management System (EDMS)—an IDWR database
- STORET—an EPA database

Miscellaneous Resources

- GIS coverages from DEQ and other agencies
- Hydropower companies
- Private companies in timber, mining, and other related industries
- Internet searches
- Other appropriate resources

Information obtained from these sources should be included with the total information used to select sampling sites and also kept with the site or water body file so it may be incorporated in the assessment process as recommended in Grafe et al. (2002a).

1.2 Coordinating Aquatic Monitoring Statewide

It is strongly recommended that each DEQ regional office either facilitate or participate in an annual monitoring coordination meeting. This is consistent with the *Consolidated Assessment and Listing Methodology* (CALM) (EPA 2002), which identifies the need to coordinate or inventory monitoring activities.

To be successful, this effort requires input and participation from all state, federal, tribal, and private entities engaged in aquatic monitoring. An effective coordination meeting will reduce duplication of effort, improve program efficiency, increase sharing of scientific and biological data and sources, and facilitate networking among all agencies and personnel involved in aquatic monitoring. Appendix A contains a sample invitation letter for an aquatic monitoring coordination meeting.

1.3 Determining Whether to Use the BURP Stream Protocol

1.3.1 Importance of Determining Water Body Size

DEQ found that only two size categories were necessary to represent small to large water body characteristics for bioassessment purposes.

This size distinction is critical in BURP methodology because DEQ uses different monitoring protocols and bioassessment tools for assessing the aquatic life support use of streams and rivers. The methods in this manual are for streams only, so it must be determined whether the water bodies where BURP monitoring is planned are classified as streams by DEQ.

1.3.2 Use of the Terms “Streams” and “Rivers”

The *Water Body Assessment Guidance* (Grafe et al. 2002a) uses water body size criteria to distinguish between two classes of flowing water: streams and rivers. Previously, the smaller stream classification was referred to as “wadeable streams” or “small streams.” However, the distinctions between “wadeable” and “non-wadeable” are not always clear. Similarly, the meaning of “small” was not always uniformly defined. DEQ decided to simply call the smaller size classification “streams” and the larger classification “rivers.” It should be noted that these classifications are specifically for DEQ use and the terms may not be defined the same way in standard dictionaries.

1.3.3 Water Body Size Determinations

Through literature review and data analysis, DEQ found that no one criterion entirely distinguishes among water body sizes in Idaho. Consequently, DEQ uses three criteria to determine water body size: stream order, average wetted width at base flow, and average depth at base flow. The method for making this determination is given below. Supporting analysis for this method is detailed in “Water Body Size Criteria” (Grafe 2002b).

1.3.4 Method for Classifying a Stream or a River

DEQ rates a water body against each criterion, as shown in Table 1, and then averages the rating or score (total rating points divided by three criteria).

Table 1. Points for Rating Water Body Size Based on Three Criteria

Criteria			Corresponding Size Category and Rating Points
Stream Order	Avg. Wetted Width at Base Flow (m)	Avg. Depth at Base Flow (m)	
≥ 5	≥ 15	≥ 0.4	Large/River: 3
< 5	< 15	< 0.4	Small/Stream: 1

If a water body’s average score for these three criteria is greater than or equal to 1.7, DEQ designates it a river; if its average score is less than 1.7, it is classified a stream (Table 2).

Table 2. Water Body Size Classifications Based on Average Rating Scores

Average Rating Points Score	Water Body Class
≥ 1.7	River
< 1.7	Stream

If a water body does not score the same on all three criteria (i.e., it scores two 1s and a 3, or two 3s and a 1), evaluate it further using additional measures of stream size. The ultimate goal of classifying water body size is to ensure that the proper monitoring and assessment protocols are used. If a water body originally considered to be a stream has physical and biological characteristics indicative of a river, the river protocols should be used instead of the stream protocols in this manual.

1.4 Site Selection Process

The site selection process entails both office and field steps to ensure efficiency and representativeness. Although only the pre-selection steps are part of the planning phase, the entire site selection process is outlined here. The pre-selection steps are presented in detail here; the final selection steps are presented in sections 2 and 3.

Selecting monitoring sites that are representative of entire water bodies is critical to how the data may be interpreted and assessed. Specifically, the objectives of the site selection process are to:

- determine how many sites are needed to characterize the beneficial use status of the stream
- help ensure that sampling sites do represent the streams they are intended to represent
- verify in the field that sites initially selected in the office can be used.

1.4.1 Ensuring Representativeness

BURP currently attempts to representatively monitor every stream in Idaho. From 1993 through 2001, DEQ surveyed more than 4,000 sites. These sites represent about 60% of the 2,500 water body identification (WBID) units and 4,700 assessment units (AUs). A WBID usually represents a small watershed and is used in Idaho's water quality standards to geo-locate waters in the state. The scale of a WBID is generally comparable to a 6th-field (12-digit hydrologic unit code [HUC]) watershed although some may be larger or smaller. The AU is a mechanism for grouping waters within a WBID into a meaningful unit for assessment purposes. Presently, most AUs are grouped based on stream order and land use; however, DEQ staff members have the option to further delineate AUs based on additional information. Therefore, the number of WBIDs in Idaho is presently a fixed total, whereas the total number of AUs will continue to change based on current and future assessment decisions. Figure 5 illustrates the scale differences among HUCs, WBIDs, and AUs.

DEQ uses stream order to define AUs within WBIDs to characterize comparable water body segments and ensure representative monitoring sites. In essence, AUs allow DEQ to compare streams and interpret site data. Presently, DEQ attempts to representatively monitor all AUs. To effectively monitor all the streams in Idaho, any one BURP reach should not represent more than AU. (It should be noted that first and second stream orders are combined when defining AUs.) In other words, if a WBID has three AUs, then at least one BURP reach per AU must be established to assess beneficial use support status for the entire stream. Regional BURP Coordinators sometimes consider Rosgen stream type(s) as well when choosing reaches for BURP monitoring. Each reach's length must equal 30 times the general bankfull width, or a minimum of 100 meters. Figure 6 illustrates placement of a BURP reach in an AU. Figure 11 (page 20) provides more details regarding the BURP reach layout.

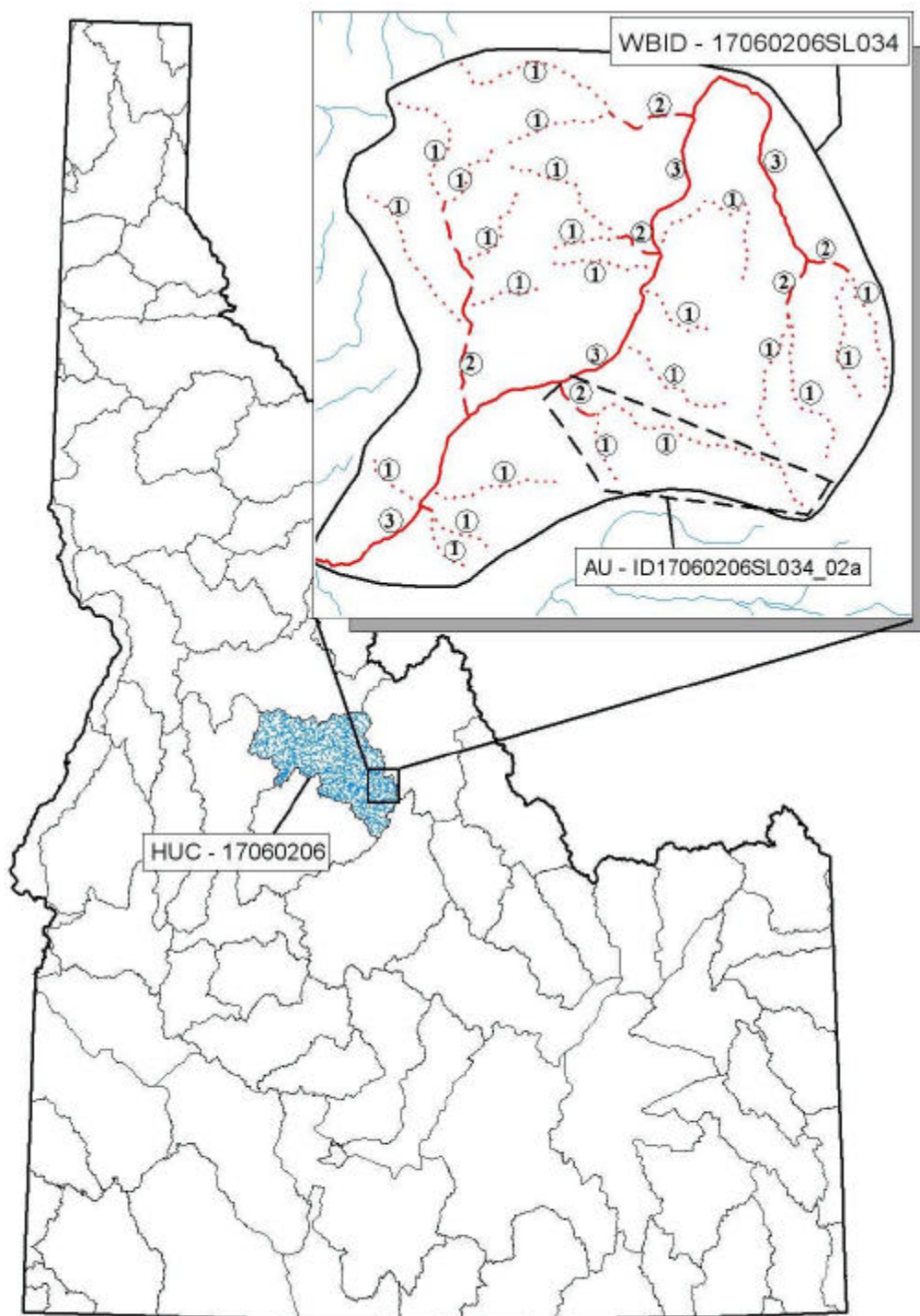


Figure 5. Scale differences among HUCs, WBIDs, and AUs

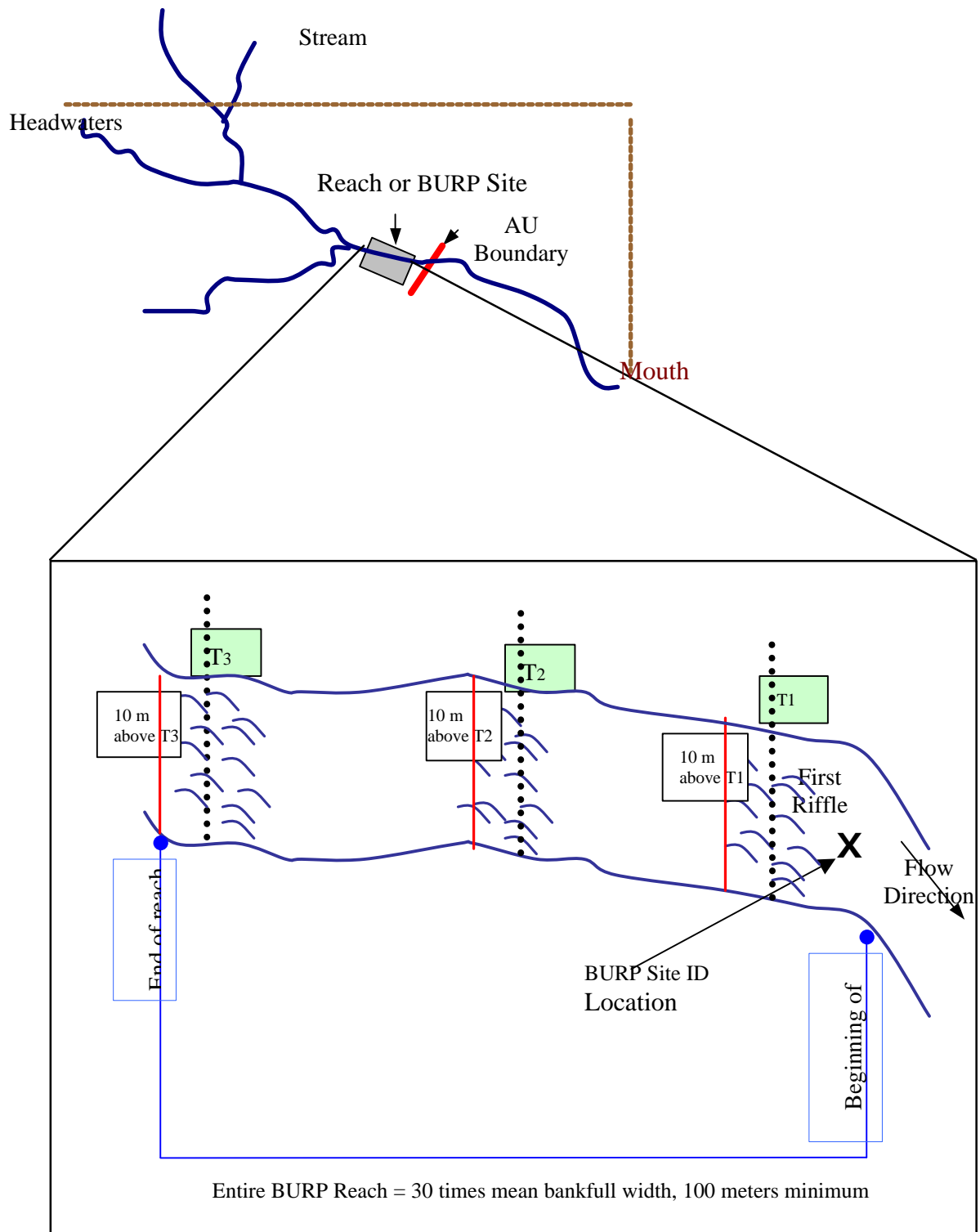


Figure 6. Placement of a BURP reach in an AU.

1.4.2 Steps in the Site Pre-Selection Process

To ensure assessments can be applied to longer stream reaches or entire streams, the BURP monitoring sites must be representative. DEQ uses standard pre-selection steps to identify potentially representative sites. These pre-selection steps are done in the office before the field season starts. The BURP Coordinator starts by consulting with other resource agency representatives, reviewing existing stream data, investigating aerial photos, and gathering other information.

Next, the BURP Coordinator selects several reaches that appear to represent the AU for a particular water body. The following in-office procedures summarize this pre-selection process and its documentation.

- Photocopy the portion of a 1:24,000 topographical map(s) that includes the water body to be monitored.
- Write the site ID and map scale on the map and include it with the site file. (BURP sites will be marked on the map later, when they are confirmed.) Figure 7 is a sample of such a map.
- Determine AUs for the entire length of the water body. Remember that first and second order streams are usually combined into one AU within a WBID (Grafe et al. 2002a). In these cases, use the second order portion to represent the water body. Select the first stream order only if it is defined as a separate AU by DEQ staff.
- Identify major land use changes (based on forest practices, grazing, agriculture, development or other uses) and mark them on the map. Note that these may be determined or modified when the field crew visits the site. See Figure 7 for an example.

1.4.3 Random Site Verification Process

The randomly generated site lists are generated in two parts, a target list and an alternate list. Every effort to sample target sites should be made, however some sites are considered non-sampleable. See section 1.4.3.1 and 1.4.3.2 for categories of non-sampleable sites. If a target site is not sampled, this must be documented by creation of a BURP Site Identification number and listing the reason why the site was not sampled according to the following protocols. Then the next sequentially numbered site from the alternate site list must be monitored so that the total number of sites laid out in the Ambient Monitoring Plan is monitored.

1.4.3.1 Safety

Although every effort should be made to access the exact x-site, there are considerations that make this impractical. Safety of the crew is the primary concern and should the crew feel that either accessing or working at a site is unsafe, it should be dropped and the next alternate-list site picked up. Cliffs, high flows and unsafe trails are examples of these safety issues. If a site cannot be reached at the present time due to barriers that may not be present at some future date (e.g., forest fire, high water, temporary road closure, unsafe weather conditions) the site should be recorded as “Not Visited –Temporarily Inaccessible.” Whether to access a remote site is left to the discretion of the regional coordinator. As a guideline, for those sites located in remote,

roadless, or wilderness areas a minimum of a two-hour hike should be attempted to access the site. Additional resources may be used to allow for packing into a site or for air transport at the discretion of the regional office.

1.4.3.2 Non-Sampleable Categories

Following are reasons for a site to be considered non-sampleable, along with directions on how to record this on the field forms.

1.4.3.2.1 Dry Channel

A visible stream channel is present but there is no flowing stream present within a reach centered on the x-site that is 30 times as long as the bank full width. If this is determined at the time of sampling visit, record “Visited-Dry” on the field form ; if the site was determined to be dry (or otherwise non-perennial) from another source and/or field verified before the actual sampling visit, record as “Not Visited-Dry.”

1.4.3.2.2 Wetland (no definable stream channel)

There is standing water present, but no definable stream channel. In cases of wetlands surrounding a stream channel, define the site as Target but restrict sampling to within the stream channel. Record x-site as “Visited-Wetland” if this determination is made at the time of the site visit or record “Not Visited-Wetland” if this determination is made from another source and/or field verified before the actual sampling event.

1.4.3.2.3 Map Error

Based on ground truthing, no evidence exists that a water body or stream channel was ever present at the coordinates provided or within a 150-meter diameter of the x-site. Record site as “Visited-Map Error.” If a water body is present within a 150-meter diameter of the x-site, establish an x-site at an equivalent position on the stream and continue sampling making note of the change in latitude and longitude of the x-site. If a dry stream channel exists within a 150-meter diameter of the x-site, establish an x-site at an equivalent position on the stream, determine the upstream and downstream direction of the stream, determine the GPS latitude/longitude, and coordinate the readings on an ArcView map for positional placement.

1.4.3.2.4 Impounded Stream

If the stream is submerged under a lake or pond due to man-made or natural (e.g., beaver dam) impoundment, record the stream as “Visited-Altered” and do not sample.

1.4.3.2.5 Access Permission Denied

The site must be recorded as “Not Visited-Access Denied.”

1.4.3.2.6 Permanently Inaccessible

If the site is unlikely to be sampled by anyone due to physical barriers that prevent access to the site (e.g., cliffs), record the site as “Not Visited-Inaccessible.”

1.4.3.2.6.1 Other

If the site is not sampleable for reasons other than those above, reasons may include:

1.4.3.2.6.2 Threatened and Endangered Species Present

The presence of spawning salmon or other spawning threatened and endangered species precludes any attempts to sample. The site should be recorded as “Visited-T&E species present” and the next alternate-list site sampled.

1.4.3.2.6.3 Non-wadeable

The reach length is not wadeable. BURP protocols were developed specifically for wadeable streams, so sites where the reach is non-wadeable should be marked as “Visited-Non-Wadeable” and the next alternate-list site sampled.

1.4.3.3 Sampleable Categories

If the site is sampleable, one of the following two categories should be recorded on the field form.

1.4.3.3.1 Wadeable

The stream can be sampled with wadeable stream protocols as per the BURP field manual.

1.4.3.3.2 Altered Channel

There is a stream at the location marked with the x-site on the map, but the stream channel does not appear the way it is drawn on the map. An example would be a channel that was re-routed following a flood event that cut off a loop of the stream. Establish a new x-site at the same relative position in the altered channel. Make careful notes and sketches of the changes on the field form.

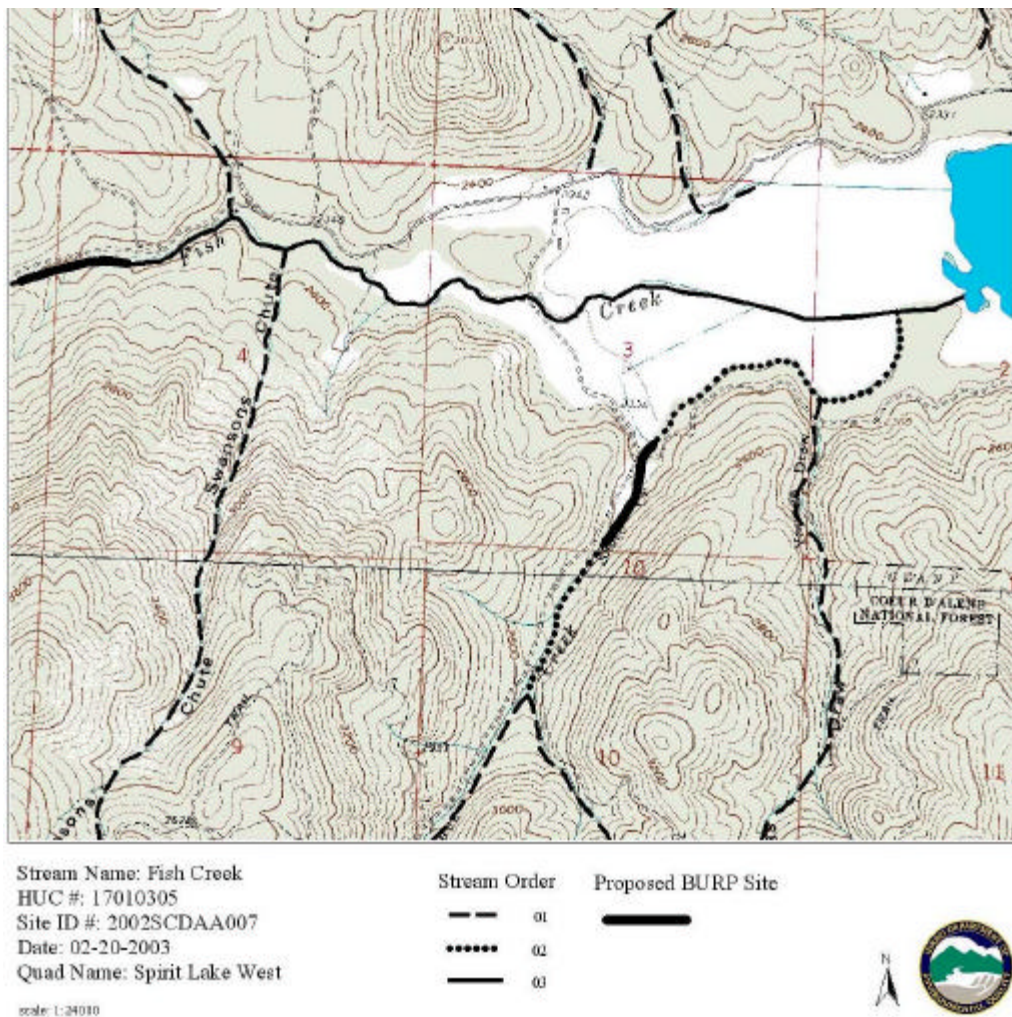


Figure 7. Topographic map section with site ID, scale and proposed BURP sites marked.

2 Preparing for BURP Field Activities

Preparing for field work includes determining property ownership of pre-selected sites, getting permission to access the property if it is private, pre-selecting different sites if permission is not granted, and gathering equipment and supplies. These steps are detailed below and shown in the Preparing box in Figure 8.

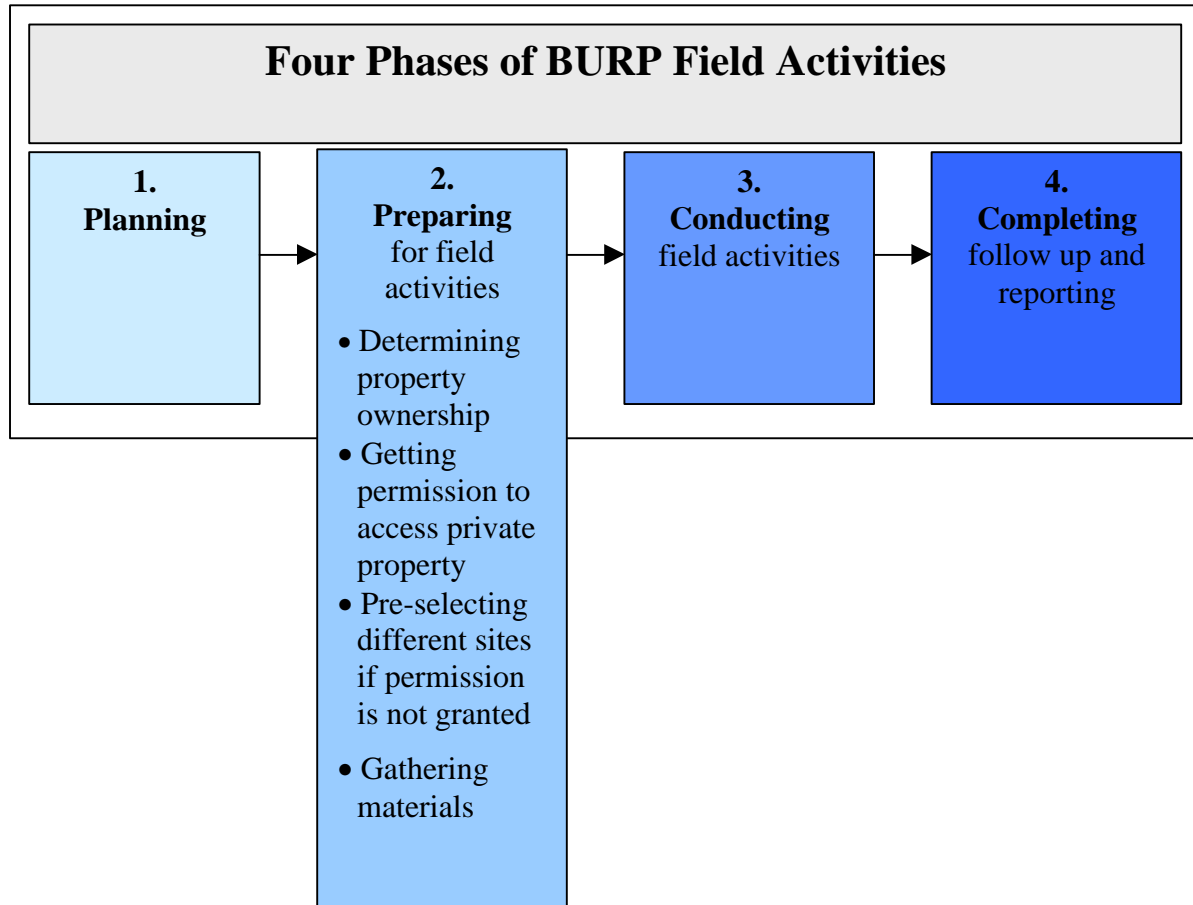


Figure 8. Steps in the Preparing for Field Activities phase.

2.1 Determining Property Ownership

The BURP Coordinator will identify and contact the property owner. Crew members may be required to make follow-up contacts. Establish that the contact is the appropriate authority for the property in question.

2.2 Getting Permission to Access Private Property

Each regional office is responsible for securing landowner permission to access private property for BURP monitoring. Follow the steps below to help ensure good working relationships with landowners whose cooperation allows comprehensive monitoring.

Contact the property owner either by phone or in person. According to BURP policy, the BURP Coordinator will make the initial contact. An optional informative “flyer” (see Appendix B) may be either mailed or hand-delivered to the appropriate party, but it cannot be substituted for getting permission by telephone or in person. A flyer is simply an informative tool that provides general information regarding the intent and purpose of BURP monitoring. The flyer should provide full DEQ contact information so that the landowner/representative could later call or write DEQ for more information or alert DEQ of any changes in the agreement, logistics, etc.

When talking with landowners, be courteous and honest while explaining the intent and purpose of the visit. It is important to answer their questions and assure them that BURP methods will not damage their property or the resource.

If permission is granted, but the site visit is scheduled for a later time (and it often is), inform the owner that you will contact them on or immediately before the day of the site visit (before going to the site). If they or their appropriate representative will be unavailable at that time, confirm that they are in full accordance with the visit.

In accordance with BURP policy, document landowner contact information must be documented. The Private Property Owner Contact Record shown in Figure 9 provides an easy way to document the landowner/contact’s name, address, and phone number; the time, date, and place of the visit or telephone call; and the results of the visit or phone call (was permission granted or denied?). This record should be filled out while talking to the landowner or immediately after and then filed in the site or water body file.

Private Property Owner Contact Record Beneficial Use Reconnaissance Program	
Land Owner:	Other Contact(s):
<u>Ownership of property in question confirmed?</u> <input type="checkbox"/> Yes <input type="checkbox"/> No	
Address:	
Phone Number: ()	
<u>Date of Contact:</u> _____	<u>Time of Contact:</u> _____ <u>Contacted:</u> <input type="checkbox"/> By Phone <input type="checkbox"/> In Person
<u>Permission Granted:</u> <input type="checkbox"/> Yes <input type="checkbox"/> No	
Notes about accessing property (things to watch out for, avoid, etc.):	
Directions to Property:	
If site was visited, <u>Thank You card sent on (date):</u> _____.	

Figure 9. Private Property Owner Contact Record.

If permission is granted and if the owner has time, ask questions about the site, particularly regarding site history and characteristics (fish sightings, typical high water levels, flooding events, etc.). This can be valuable information not readily available elsewhere. Let the owner know his knowledge and input are valued. As a general rule, listen more and talk less. Be sure to include this information in the Comments section of the field form.

2.3 If Permission Is Not Granted

Never argue or try to persuade if access is denied; simply thank the person and hang up the phone or leave the property and find another representative site.

2.4 Gathering Materials

In the spring, BURP Coordinators gather and prepare the materials to be used during the field season, including paperwork, supplies, gear, and vehicles. Appendix C contains a checklist that can be used to ensure nothing is overlooked. The coordinators ensure vehicles and gear have received any necessary maintenance and that paperwork and supplies are available or will be available when needed.

